

Second Edition

GLOSSARY OF GEOLOGY

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of rock that narrows or thins progressively in a given horizontal direction until it disappears and the rocks it once separated are in contact; esp. a *stratigraphic trap* formed by the thinning-out of a porous and permeable sandstone between two layers of impermeable shale. The lithologic character of the stratum is typically maintained to the feather edge. Cf. *shale-out*. See also: *wedge-out*.

pinfire opal Opal in which the patches of *play of color* are very small and close together and usually less regularly spaced than in *harlequin opal*.

pinger A battery-powered, low-energy source for an *echo sounder*.

pingo (a) A large *frost mound*, esp. a relatively large conical mound of soil-covered ice (commonly 30-50 m high and up to 400 m in diameter), raised in part by hydrostatic pressure of water within or below the permafrost of Arctic regions (esp. Canada), and of more than one year's duration; an intrapermafrost ice-cored hill or mound. Its crest is sometimes ruptured or collapsed due to melting of the ice, thus forming a star-shaped crater; the term has also been applied to such a depression (Monkhouse, 1965, p.237). The mound itself often resembles a small volcano. The term was introduced for this feature by Porsild (1938, p.46). Pl: pingos. See also: *ground-ice mound*; *ice laccolith*. Syn: *boolgoonyakh*. (b) The term has been used in several related senses, as a conical hill or mound, or as a hill completely covered by an ice sheet but revealing its presence by surface indications (ADTIC, 1955, p.61).—Etymol: Eskimo, "conical hill" Syn: *pingok*.

pingok *pingo*.

pingo remnant A rimmed depression, as in the northern Netherlands, where it was previously regarded as a kettle (Gravenor & Kupsch, 1959, p. 62). It is formed by rupturing of a pingo summit resulting in exposure of the ice core to melting followed by partial or total collapse. See also: *fossil pingo*. Syn: *pseudokettle*.

pinguite *nontronite*.

pinhole chert Chert containing weathered pebbles pierced by minute holes or pores.

pinite A compact, fine-grained, usually amorphous mica (chiefly muscovite) of a dull-gray, green, or brown color, derived from the alteration of other minerals (such as cordierite, nepheline, scapolite, spodumene, and feldspar).

pink snow *red snow*.

pinna A primary subdivision of a pinnately compound leaf or frond; a leaflet. See also: *pinnule* [bot]. Pl: *pinnae*.

pinnacle [geomorph] (a) A tall slender tapering tower or spire-shaped pillar of rock, either isolated or at the summit of a mountain or hill; esp. a lofty peak. (b) A hill or mountain with a pointed summit.

pinnacle [reef] A small, isolated spire or column of rock or coral, either slightly submerged or awash; specif. a small reef patch, consisting of coral growing sharply upward (with slopes ranging from 45° to nearly vertical), usually within an atoll lagoon, often rising close to the water surface. Syn: *pinnacle reef*; *reef pinnacle*; *coral pinnacle*.

pinnacled iceberg An irregular iceberg, shaped and weathered in such a way as to be topped with spires and pinnacles.

pinnacle reef (a) A syn. of *pinnacle* [reef]. (b) A term used in the Michigan Basin to apply to an isolated stromatoporeid-algal reef mound, now dolomitized, in the Middle Silurian rocks of the subsurface; many are productive of oil. They range up to 500 acres in area and 500 feet in relief, with slopes rarely exceeding 15 degrees. They are mounds rather than true pinnacles.

pinnate (a) Having leaflets or veins on each side of a common axis in a featherlike arrangement (Swartz, 1971, p. 358). (b) Referring to an erect growth habit of colonies of stenolaemate bryozoans, in which lateral branches grow in the same plane from opposite sides of a main axial branch.

pinnate drainage pattern A *dendritic drainage pattern* in which the main stream receives many closely spaced, subparallel tributaries that join it at acute angles, resembling in plan a feather; it is believed to indicate unusually steep slopes on which the tributaries developed.

pinnate jointing *feather jointing*.

pinnate venation A type of *net venation* in which the secondary veins branch from the midrib in parallel pattern. Cf: *palmette venation*.

pinnoite A yellowish tetragonal mineral: $MgB_2O_4 \cdot 3H_2O$.

pinnular A plate forming part of a pinnule of a crinoid.

pinnule [bot] A subdivision of a *pinna*, or a secondary subdivision of a pinnately compound leaf or frond; a secondary leaflet.

pinnule [paleont] (a) One of several generally slender, unbifurcat-

ed, uniserial branchlets of the food-gathering system of a crinoid arm, typically borne on alternate sides of successive brachial plates. (b) A secondary branch of a plumelike organ, such as a digitate lateral branch of a tentacle of an octocoral polyp or one of the biserial branches of the cystoid *Caryocrinites*.—Also spelled: *pinule*.

pinolite A metamorphic rock containing magnesite (breunnerite) as crystals and granular aggregates in a matrix of phyllite or talc schist. It is so named because the magnesite inclusions commonly resemble pine cones in shape (Holmes, 1928, p.184).

pintadoite A green mineral: $Ca_2V_2O_7 \cdot 9H_2O$.

pinule (a) Var. of *pinnule*. (b) *pinulus*.

pinulus A sponge spicule (usually a pentactine or hexactine) in which one ray (such as the unpaired one in a pentactine) is enlarged and projects either internally or externally from the sponge and bears numerous small oblique spines giving the spicule the appearance of a pine tree. Pl: *pinuli*. Syn: *pinule*.

pinwheel garnet A porphyroblastic garnet with inclusions so arranged as to suggest rotation during formation.

pioneer In ecology, a community, species, flora, fauna, or individual that establishes itself in a barren area, initiating a new ecologic cycle or *sere*. Cf: *climax*.

piotite *saponite*.

pipe [grd wat] *geyser pipe*.

pipe [intrus rocks] A discordant pluton of tubular shape.

pipe [ore dep] A cylindrically shaped, more or less vertical orebody. The ore may be a vein deposit, a breccia column, or a diamond-bearing volcanic breccia. Syn: *ore pipe*; *ore chimney*; *chimney* [ore dep]; *neck* [ore dep]; *stock* [ore dep]

pipe [sed] (a) A tubular cavity from several centimeters to a few meters in depth, formed esp. in calcareous rocks, and often filled with sand and gravel; e.g. a vertical joint or sinkhole in chalk, enlarged by solution of the carbonate material and filled with clastic material. See also: *sand pipe*. (b) *clastic pipe*.

pipe [volc] A vertical conduit through the Earth's crust below a volcano, through which magmatic materials have passed. It is usually filled with volcanic breccia and fragments of older rock. As a zone of high permeability, it is commonly mineralized. Cf: *plug* [volc]; *chimney* [volc]; *vent*; *diatreme*. Syn: *breccia pipe*.

pipe amygdale An elongate amygdale that occurs in a lava, towards the base of the flow, probably formed by the generation of gases or vapor from the underlying material.

pipe clay (a) A white to grayish-white, highly plastic clay, practically free from iron, suitable for use in making tobacco pipes. The term has been extended to include any white-burning clay of considerable plasticity. Syn: *ball clay*; *cutty clay*. (b) A mass of fine clay, generally of lenticular form, forming the surface of bedrock, on which the gravel of deep leads (old river beds) frequently rests.—Also spelled: *pipeclay*

piperno A welded tuff characterized by *fiamme*, or flame structures. Such a rock is said to be pipernoid. Etymol: Italian.

pipernoid Said of the eutaxitic texture of certain extrusive igneous rocks, e.g. *piperno*, in which dark patches and stringers occur in a light-colored groundmass. Also, said of a rock exhibiting such texture.

pipe-rock A marine sandstone containing abundant *scolithus* structures.

pipe-rock burrow *scolithus*

pipestone A pink or mottled argillaceous stone, carved by the Indians into tobacco pipes; esp. *catlinite*.

pipette analysis A kind of particle-size analysis of fine-grained sediment, made by removing samples from suspension with a pipette.

pipe vesicle Slender vertical cavities a few centimeters or tens of centimeters in length extending upward from the base of a lava flow. Most are formed by water vapor, derived from the underlying wet ground, that streamed upward into the lava. Cf: *spiracle*.

piping Erosion by percolating water in a layer of subsoil, resulting in caving and in the formation of narrow conduits, tunnels, or "pipes" through which soluble or granular soil material is removed; esp. the movement of material, from the permeable foundation of a dam or levee, by the flow or seepage of water along underground passages. See also: *water creep*. Syn: *tunnel erosion*.

piprake (a) A small, thin spike or needlelike crystal of ground ice, from 2.5-6 cm in length, formed just below, and growing perpendicular to, the surface of the soil in a region where the daily temperatures fluctuate across the freezing point. It is common in periglacial areas, where it contributes to the sorting of material in

catface.

cathodoluminescence The emission of characteristic visible luminescence by a substance that is under bombardment by electrons.

cathole A local term used in southern Michigan for a shallow boggy depression less than an acre in extent, esp. one formed by a glacier in a till plain (Veatch & Humphrys, 1966, p. 59).

cat ice *shell ice*.

cation exchange The displacement of a cation bound to a site on the surface of a solid, as in silica-alumina clay-mineral packets, by a cation in solution. Syn: *base exchange*. See also: *ion exchange*.

catkin *ament*.

catlinite A red, siliceous, indurated clay from the upper Missouri River valley region (SW Minnesota), formerly used by the Dakota Indians for making tobacco pipes; a *pipestone*. Named after George Catlin (1796-1872), American painter of Indians.

catocin A residual knob, hill, or ridge of resistant material rising above a peneplain and preserving on its summit a remnant of an older peneplain. Named after Catocin Mountain, Maryland & Virginia. Cf: *monadnock*.

catogene Pertaining to sedimentary rocks, signifying that they were formed by deposition from above, as of suspended material. Cf: *katogene*.

catophorite *kataphorite*.

catoptrite *katoptrite*.

Ca-Tschermak molecule A synthetic pyroxene, $\text{CaAl}(\text{AlSi})\text{O}_6$; a hypothetical component of natural pyroxenes. Not to be confused with *tschermakite*. Syn: *Tschermak molecule*.

cat's-eye [gem] Any gemstone that, when cut *en cabochon*, exhibits under a single strong point-source of light a narrow, well-defined chatoyant band or streak that moves across the summit of the gemstone, shifts from side to side as it is turned, and resembles a slit pupil of the eye of a cat. Internal reflection of light from parallel inclusions of tiny fibrous crystals or from long parallel cavities or tubes causes the "cat's-eye". Gemstones exhibiting this phenomenon include chrysoberyl, quartz, sillimanite, scapolite, cordierite, orthoclase, albite, beryl, and tourmaline. See also: *chatoyancy*.

cat's-eye [mineral] (a) A greenish gem variety of chrysoberyl that exhibits *chatoyancy*. Syn: *cymophane*; *oriental cat's-eye*. (b) A variety of minutely fibrous, grayish-green quartz (chalcedony) that exhibits an opalescent play of light. Syn: *occidental cat's-eye*. (c) A yellowish-brown silicified form of crocidolite. Cf: *tiger's-eye*. —The term, when used alone, is properly applied only to chrysoberyl.

catstep A *terracette*, esp. one produced by slumping of deep loess deposits as in western Iowa. Also spelled: *cat step*.

catter Shortened form of *bellicatter*, a syn. of *icefoot*.

cattierite A mineral with pyrite structure: CoS_2 .

cauda The slender proximal portion of an autozoecium in some cheilostome bryozoans, comprising part of the gymnocyst and adjacent parts of lateral and basal walls (Thomas & Larwood, 1956, p. 370). Pl: *caudae*.

caudal fan A powerful swimming structure in malacostracan crustaceans, consisting of a combination of laterally expanded uropods and telson, and constituting a means of steering and balancing. Syn: *tail fan*.

caudal furca A crustacean *furca* consisting of a pair of caudal rami.

caudal process In certain ostracodes, a prolongation (usually pointed) of the posterior end of the carapace, commonly situated at or near mid-height.

caudal ramus One of a pair of appendages of the telson of a crustacean. It is usually rodlike or bladelike, but may be filamentous and multiarticulate. Syn: *caudal appendage*; *cercus*.

Caudata A superorder of the lissamphibians, characterized by a tail and nonhopping gait. It includes the salamanders, newts, and caecilians.

caudex A basal part of the axis of an erect plant where it is neither clearly stem, rhizome, or root; the persistent base of an otherwise annual herbaceous stem (Fernald, 1950, p.1571).

cauk (a) A dialectal British term for a limestone or chalk. Syn: *calc*. (b) *cawk*.

cauldron [marine geol.] *caldron [marine geol.]*.

cauldron [volc] As used by Smith & Bailey (1968), an inclusive term for all volcanic subsidence structures regardless of shape or size, depth of erosion, or connection with the surface. The term thus includes *cauldron subsidences*, in the classical sense, and

collapse calderas.

cauldron subsidence A structure resulting from the lowering along a steep ring fracture of a more or less cylindrical block into a magma chamber; usually associated with ring dikes. Also, the process of forming such a structure. The ring fracture may or may not reach the surface of the Earth. See also: *ring-fracture stoping*; *surface cauldron subsidence*; *underground cauldron subsidence*.

caulescent Said of a plant that is more or less stemmed or stem-bearing; having an evident stem above ground (Lawrence, 1951, p.743).

caulk *cawk*.

caunter lode *cross vein*.

cause A French syn. of *karst*, in some usages implying a karstic plateau of relatively small size, or one restricted to southeastern France. Etymol: French dialect for *chaux*, "lime".

caustic n. (a) A curve representing a locus of points where a set of rays (as of light or sound) are brought exceptionally close together owing to the refractive properties of the medium through which they travel; specif. the curve to which adjacent orthogonals of waves, refracted by a bottom whose contour lines are curved, are tangents. Syn: *caustic curve*. (b) The envelope of the system or sequence of such rays. Syn: *caustic surface*.

caustic metamorphism The indurating, baking, burning, and fritting effects of lava flows and small dikes on the rocks with which they come in contact. The term was originated by Milch in 1922. Cf: *baking*. Syn: *optalic metamorphism*.

caustobiolith A combustible organic rock (Grabau, 1924, p.280). It is usually of plant origin. Cf: *acaustobiolith*.

caustolith A rock that has the property of combustibility (Grabau, 1924, p.280). It is usually of organic origin (e.g. coal and peat), but inorganic deposits (e.g. sulfur, asphalt, graphite) also occur.

caustophytolith A *caustobiolith* formed by the direct accumulation of vegetal matter; e.g. peat, lignite, and coal.

caustozoolith A rare *caustobiolith* formed by the direct accumulation of animal matter (Grabau, 1924, p.280); e.g. some oils.

cavaedium An irregular space within a sponge, communicating directly with the exterior, but morphologically outside the sponge in that it is lined by exopinacoderm. Pl: *cavaedia*.

cavalorite A granular plutonic rock containing more potassium feldspar than oligoclase. Named by Capellini in 1877 after Monte Cavaloro, Italy. Obsolete. Cf: *oligoclaseite*.

cavansite An orthorhombic, greenish-blue mineral: $\text{Ca}(\text{VO})(\text{Si}_4\text{O}_{10}) \cdot 6\text{H}_2\text{O}$. It is dimorphous with pentagonite.

cavate (a) Descriptive of spores whose exine layers are separated by a cavity, including a rather slight separation as well as a more extensive separation producing a bladderlike protuberance (pseudosaccus). Syn: *camerate [palyn]*. (b) Said of a dinoflagellate cyst with space or spaces of notable size between periphragm and endophragm (as in *Deflandrea phosphorica*).

cave [coast] *sea cave*.

cave [speleo] (a) A natural underground open space, generally with a connection to the surface and large enough for a person to enter. The most common type of cave is formed in limestone by dissolution. Partial syn: *cavern*. (b) A similar feature that was formed artificially. (c) In informal use, any natural rock shelter, e.g. a *cliff overhang*.

cave balloon *cave blister*

cave blister A partly or completely hollow hemispherical to nearly spherical speleothem, usually of gypsum or hydromagnesite, attached to a cave wall. Syn: *cave balloon*.

cave breakdown The collapse of the ceiling or walls of a cave; also, the accumulation of debris thus formed. See also: *cave breccia*. Syn: *breakdown*.

cave breathing The back-and-forth movement of air in the constricted passages of caves, usually with a cycle of a few minutes. See also: *blowing cave*.

cave breccia Angular fragments (*cave breakdown*) of limestone that have fallen to the floor from the roof and sides of a cave and that are cemented with calcium carbonate or occur in a matrix of cave earth. See also: *collapse breccia*; *solution breccia*.

cave bubble A nonattached hollow sphere, usually of calcite, that has formed around a gas bubble on the surface of a cave pool. Syn: *calcite bubble*.

cave coral A rough, knobby speleothem, usually of calcite, that resembles coral. Syn: *botryoid*; *cave popcorn*; *coralloid*.

cave cotton Thin flexible filaments of gypsum or epsomite projecting from a cave wall. Syn: *gypsum cotton*. See also: *cave flower*.

cave earth Fine-grained, generally unconsolidated detrital